

October 31, 1997

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Mr. Bill Tans
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RE: Crandon Mine Project: 94-01298-DLB

Dear Mr. Ballman and Mr. Tans:

The U.S. Environmental Protection Agency (EPA) recently reviewed the update to Section 3.5.5, Waste Characterization, of the Crandon Mine Project's Environmental Impact Report (EIR) and has the following comments and concerns that are being relayed to you for you to consider in the preparation of your respective Environmental Impact Statements. The EIR update was dated August 7, 1997 and received by the EPA on August 18, 1997. The following comments and concerns should be considered preliminary, pending the finalization of the Waste Characterization portions of the EIR by Crandon Mining Company (CMC). Some of these comments and concerns may have been brought up earlier and may even have been responded to by CMC, but are reiterated below nonetheless, as the concerns still exist.

Comment #1: Section 3.5.5, Page 3.5-71, 1st paragraph: The 2nd to last sentence states that, "Based upon an examination of the mineralogy of the rock core obtained from each formation, and the results of the ABA and kinetic testing in the areas from which waste rock will be generated, approximately one-half of the pre-production waste rock will not produce acidic leachate and will leach only minute quantities of substances." What is meant by minute quantities? Will these minute quantities be harmful to areas in which the Type I waste rock will be used in road construction near creek crossings? The EIR never really states if the minute quantities will be harmful in any way to eventual receptors. As mentioned in the 3rd paragraph of this page, "One of the objectives of the waste characterization program is to determine if the potential Type I waste rock generated during the pre-production phase of the project can be used in surface construction, such as road construction, where this material would be in direct contact with soils at the site." Stating that only minute quantities of substances will leach out of the Type I waste rock is not enough to evaluate potential impacts. Is this addressed elsewhere in the EIR?

Comment #2: Section 3.5.5, Page 3.5-71, 5th paragraph: The 2nd sentence states that, "Permanent disposal of tailings, considered to be a Type II waste, will occur both in the mine and in the TMA, both of which are engineered facilities." This is somewhat misleading in that as the TMA is being engineered as a disposal facility, the disposal of tailings as backfill into the mine is not being engineered to the same degree as would an above ground disposal facility.

Comment #3: Section 3.5.5, Page 3.5-71, 6th paragraph: EIR is not clear on what the trigger is to add the NPC (normal Portland cement). Why is it estimated that 60% of the backfilled stopes

will need NPC while the other 40% won't need it?

Comment #4: Section 3.5.5, Page 3.5-73, Table 3.5-14: Realizing that this table represents estimated waste quantities, the revised Table 4-3 in the MPA states the estimated quantity of TMA tailings and Backfill Tailings at 22,000,000 tons each, while Table 3.5-14 estimates the quantities at 22,400,000 each. A total discrepancy of 800,000 tons. Also compare to Table 4.1-1 in the TMA Report. Also, in TMA Addendum #3, in Table 9.2-1, total of Zinc Tailings (12,770,000 tons) + Copper Tailings (9,630,000 tons) + Type II Waste Rock (650,000 tons) is 23,050,000 tons. Are these discrepancies small enough not to be of concern regarding design criteria for backfill or for the TMA?

Comment #5: Section 3.5.5.2.2, Page 3.5-79: This section states that core samples of ore collected during 1993/4 were shipped to Lakefield Research for metallurgical bench scale testing. Lakefield processed the composited ore, using a flotation process to produce the zinc, copper and lead mineral concentrates. This section does not state if CMC will be using the exact or similar flotation process as used by Lakefield to produce the test tailings. It is unfortunate that a second copper composite was not analyzed in 1994 to compare to the 1979 sample results. The copper samples had more of certain constituents, such as selenium, aluminum, silicon, copper, and others. In Table 3.5-15, what does NA stand for?, Not Available? Not Analyzed? and why not. Perhaps the 1994 test should have been conducted to test the copper composite for chromium and the other "NA's". Also, the 3rd paragraph of this section states that some of the tests required the use of whole tailings. FVD was able to produce the whole tailings by proportionately recombining the two tailings size fractions. Is there any perceived difference between whole tailings and recombined whole tailings? Also, see comment #8 below.

Comment #6: Section 3.5.5.2.2.2, Page 3.5-83: The 1st paragraph states that the results of these tests (reaction of coarse and fine tailings with water) indicated that backfilling the depleted stopes with these materials will be a slightly exothermic process with no danger of overheating or spontaneous combustion. Will the addition of normal Portland cement, add to the exothermic reaction output since mixing cement is also slightly exothermic? Will this additional heat be negligible, additive or multiple and possibly cause thermal concerns?

Comment #7: Section 3.5.5.3.1.2, Page 3.5-93: Within the 4th paragraph on this page, it states, "Assuming that all of the total carbon and a portion of the calcium are combined in the form of

the mineral calcite" What other assumptions are possible? Is the assumption presented the worst case? The most likely case?

Comment #8: Section 3.5.5.3.1.2, Page 3.5-94: In the 4th full paragraph, it states, "It is expected that during full scale operations tailings materials will generally consist of 50 percent fine tailings and 50 percent coarse tailings. In the 1994 Lakefield locked cycle bench scale test the actual split was 60 percent coarse tailings and 40 percent fine tailings." Are any differences expected in the leachate composition between the 50/50 split and the 60/40 split? If 50/50 is expected, why wasn't the Lakefield study done with a 50/50 split?

Comment #9: Section 3.5.5.3.1.2, Page 3.5-97: In the 1st paragraph it states that a whole tailings composite, made up of a 60:40 ratio of coarse/fine tailings, was used in the waste characterization study. It states that no bulk chemical analysis was conducted on the whole tailings composites since the composition of the whole tailings composite can be calculated using the composition of the fine and coarse tailing materials in the appropriate ratio. As mentioned in comment 8 above, is the appropriate ratio 50/50 and not 60/40? Is there any anticipated loss or gain from analyzing two individual samples and then adding the results

proportionally?

Comment #10: Section 3.5.5.3.1.3, Page 3.5-97: In the 1st paragraph, 3rd sentence it states, "... and characterized according to relative concentration of sulfide and neutralizing mineral content (Collison, 1994b)". Was the concentration of sulfide and the neutralizing mineral content based on lab results, field tests, or visual methods? The last two sentences state that samples were taken for ABA testing from primarily from the highest sulfide mineral concentrations within a core. Were samples taken from low and medium concentrated areas for comparison of ABA values? According to the next paragraph, none were taken from intervals containing the lowest sulfide mineral concentrations. May these samples also have had the lowest neutralizing components and therefore capable of producing acidic leachate in higher concentrations than do samples with higher sulfide and higher neutralizing minerals?

Comment #11: Section 3.5.5.3.1.3, Page 3.5-98: In the 1st paragraph, last sentence, it states that, "A few data sets containing high AP and/or NP values were not plotted so that the scale of all the NP/AP plots in Figure 3.5-48a would be the same." This should be mentioned also within the Table's key. An explanation as to what effect this has on the Table should be given in the text. If the Table's axis is labeled "Maximum AP" then the maximum or high AP values should be plotted. Or provide better explanation within the text as to why the high AP and/or NP values were not used. Does this also pertain to Figures 48b, 48c and 49a and 49b? Also, in the 2nd paragraph on this page, it states, "Traditionally it has been considered that those waste rock materials in surface piles with an NP/AP value of: 1) less than 1 are considered to be potentially acid producing; 2) greater than 3 are considered to be non-acid producing; and, 3) between 1 and 3 are considered to be potentially acid or non-acid producing (Brodie, et al., 1991)." Since, traditionally, a ratio of 3:1 has been used to determine the acid producing potential of waste rock and tailings, and since historically, acid mine drainage has been the main concerns of mine waste, perhaps a 3:1 ratio is not the best to use. According to Region 10, now a 4:1 ratio is being used by some to consider acid producing potential. At one site in Idaho, the mining company stated that waste rock with an NP/AP ratio in excess of 3:1 was considered non-acid generating, while according to U.S. Forest Service personnel on that project, an NP/AP ratio of at least 5:1 should be required before a material is determined to be non-acid forming. Other mining projects are satisfied with NP/AP ratios of less than 2:1, if kinetic testing supports the assumptions. CMC should evaluate what impacts using a 4:1 or 5:1 ratio would have on their Type I/Type II waste rock determinations and on the resulting quantity of Type II rock destined for the TMA. Are the WDNR and COE satisfied with the static and kinetic testing conducted by CMC enough to rely on the 3:1 NP/AP ratio?

Comment #12: Section 3.5.5.3.1.3, Page 3.5-98: In the 2nd paragraph, it states, "What was unexpected is that about two-thirds of the high sulfide mineral content samples would be classified as potentially non-acid producing." Does this include those samples with NP/AP values between 1 and 3, within the "Zone of Uncertainty" or just above 3? This seems to be misleading because if the non-acid producing rock were only those with a NP/AP value greater than 3, and not including those values within the "Zone of Uncertainty" then instead of two-thirds of the high sulfide mineral content samples being classified as potentially non-acid producing, only about one-half would be labeled as such. Would using a ratio of 4:1 or 5:1 give results of more what is expected, as questioned in Comment #11? This needs more review. In the next paragraph, items 4) and 5) highlight that variable nature of the sulfide content of the waste rock. Since these samples were not taken in a statistical manner, as stated in the 2nd paragraph of this section, can it be assured that the samples taken are representative of the waste rock to be encountered?

Comment #13: Section 3.5.5.3.1.3, Page 3.5-99: The last sentence of the last paragraph states,

“The second conclusion is that the samples collected to prepare the master waste rock composites comprise a statistically valid representation of each formation.” The report needs more explanation as to how the samples taken statistically represent each of the master waste rock.

Comment #14: Section 3.5.5.3.1.4, Page 3.5-102: The first paragraph, third sentence states, “Although no WRC evaluations were performed for the high sulfur waste rock composites, it is expected that had they been performed that the results would have predicted that all of the high sulfur waste rock composites would have been likely acid generating.” Why weren’t these tests performed? If for nothing else, to act as a high end or to provide what WRC values would definitely be associated with acid-producing waste rock.

Comment #15: Section 3.5.5.3.2.3, Page 3.5-18: In the second paragraph, the report mentions that crusting occurred on a W/D sample of an uncemented composite sample producing a relatively impermeable surface on this sample. Will this crusting occur in the backfill? If so, will this reduce the permeability of the backfilled area, restricting the flow of groundwater and therefore inhibit the groundwater from reaching pre-mine status after mine closure? Will this act similar to cemented backfilled tailings if it does occur?

Comment #16: Section 3.5.5.3.3.1, Page 3.5-120: Considering the potential for the production of acid mine drainage, more acid leaching testing should be conducted on the waste rock, especially the Type I rock that will not be placed in the TMA and the backfilled waste rock that will be in direct contact with groundwater. Comments made earlier by EPA encouraged further leaching potential testing using TCLP methods, but CMC, in letters dated April 18 and April 30, 1996, to WDNR and COE, state their reasons for not conducting further tests using TCLP. CMC is correct in that TCLP tests are not required under law since mining waste, such as the tailings, are exempt from being considered a hazardous waste under the Beville exemptions. However, this waste can still produce leachate that is toxic, even if it is not labeled as a hazardous waste. EPA is requesting that TCLP sampling be conducted on representative waste rock and tailing samples so that impacts and mitigation methods can be better planned for. CMC correctly stated that TCLP is similar to the EP-toxicity, but did not state if an EP-toxicity test conducted in early 1980 would produce similar results to a TCLP taken today. Have technologies with regard to lab equipment sensitivities or detection limits changed in the last 15 years?

Comment #17: Section 3.5.5.3.3.2, Page 3.5-120: The first paragraph states that, “The results of the chemical and radiation tests, conducted and verified by several organizations, ...” What organizations verified the data? EPA’s earlier EIR comments were concerned with the amount of radiation being brought to the surface, possibly consolidated into higher concentrations once the copper and zinc are removed, and then the tailings disposed of above ground. A statement such as, “... these materials contain less uranium, thorium and radium, and have lower radioactivity, than nearby unmineralized crystalline rock”, may very well be accurate, but that unmineralized rock is not being mined, processed and disposed of in an above ground disposal unit so it may not be appropriate to make this comparison without more qualifications. Also, in the third paragraph, it states, “At the request of the USEPA, a further review of the radiological properties of the Crandon ore and waste rock was conducted on core ...”. Later in the paragraph it states that based on the radiological screening investigations conducted during this core shed visit it was determined that the Crandon materials produced only background levels of emissions and that these results further validated the results of previous investigations. These statements as well as the notes included in Appendix 3.5-32 are misleading. The paragraph makes it sound like the EPA has validated the results and agrees with the conclusion that the Crandon material is no worse than background. During this core shed visit, EPA made no conclusions and did not

validate the results regarding past radiological samples. The purpose of the core shed visit for the EPA was to introduce the EPA staff working on this project with the site, (a site visit was conducted the day prior to the core shed visit) and to visit the core shed as part of this site visit to become familiar in what was located at the shed. While a representative from the Menominee Tribe did bring a radiological meter, in no way was the intent of this visit, or were enough core viewed to be able to state that the previous radiological data was validated during this visit. As a matter of fact, in letter dated June 18, 1996, from Dan Cozza, EPA, was sent to Mr. Dick Diotte, CMC regarding this same matter. Comments made by EPA on the EIR, dated August 2, 1996, regarding these radiological issues, have not been fully addressed and the COE is encouraged to further this matter.

Comment #18: Section 3.5.5.3.3.3, Page 3.5-121: More detail as to how the samples were selected from what cores, to give a representative sampling of the project area should be explained. For the work done in 1979, and verified by the WGNHS, analysis was conducted using optical microscopy vs the method preferred today and used in the 1984 sampling event, transmission electron microscopy (TEM). Was the 1979 sampling on waste rock, while the 1984 sampling done on fine tailings material? If so, waste rock samples may need to be resampled using TEM. Also, since the thin sections were already prepared by Exxon personnel prior to WGNHS personnel arriving at the Exxon offices, as stated in Ostrom, 1982, the QAPP and chain-of-custody procedures should be available in an appendix. Is there any known naturally occurring veins of asbestos ore that has been identified anywhere in the general vicinity?

Comment #19: Section 3.5.5.3.3.4, Page 3.5-121: The 3rd sentence of the 1st paragraph states, "Cherry's evaluation (1983) of the acid generation potential of the Crandon tailings concluded that it is likely that these tailings will not develop acidic pore water due to the carbonate mineral content, particularly if the surface of the tailings is covered soon after impoundment." By stating, "particularly if the surface of the tailings is covered soon after impoundment", makes it sound like even if the tailings were not covered immediately, that they may still likely not produce acidic pore water. Is this what it is intending to state? Is this a time relative issue, i.e., once the carbonate mineral content is used up, then acid would be produced? How do Tables 3.5-58 and 60 fit in with the statement that no acidic pore water will be generated when as shown in these tables, the pH in the samples dropped overtime for fine and whole tailings composites?

Comment #20: Section 3.5.5.4, Page 3.5-123: In regards to the procedures to determine Type I vs Type II, what is the chance of error and what are the consequences of error? Is it strictly, if in doubt the rock will be Type II? See comment 11 regarding NP/AP values.

Comment #21: Tables in Apx 3.5-33: For waste rock composite samples, the tables should include all the parameters, chemical and physical, as outlined on pages 3.5-33-2 through 3.5-33-6. For example, pH, temperature, etc.

If you have any questions on the above comments, please give me a call at (312) 886-7252. As stated above, these comments should be considered preliminary until such time that a final Waste Characterization Report is submitted by CMC.

Sincerely,

Daniel J. Cozza
Crandon Mine Project Manager
U.S. Environmental Protection Agency

cc:

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